Claims

1. A method of modifying the values of a plurality of digital filter coefficients which are used by a digital filter which is a component of a relay station, the relay station successively receiving a first signal, modifying the first signal using the digital filter to form a second signal, and transmitting the second signal with amplification, said first signal including a master signal subject to an interference and a coupling component derived from the second signal, the method comprising:

(i) interrupting said transmission of the second signal;

(ii) deriving an estimate of said interference and storing the derived interference estimate;

(iii) resuming said transmission of the second signal; and

(iv) modifying said digital filter coefficients using said stored interference estimate and said second signal, to reduce the difference between said second signal and said master signal.

2. A method according to claim 1 in which said step (iv) is repeated iteratively, whereby the difference between said second signal and said master signal is successively reduced.

3. A method according to claim 2 in which, upon performing each step (iv), a first parameter is derived characterizing the difference between said second signal and said master signal, and step (iv) is repeated until the value of said first parameter traverses a predefined convergence value.

4. A method according to claim 3 in which, upon said first parameter traversing said predefined convergence value, at least one step is performed, using said received signal but not using said stored interference estimate, of updating said digital filter coefficients to reduce the difference between said second signal and said master signal.

5. A method according to claim 3 in which, after said first parameter traverses the predefined convergence value, a second parameter characterizing the difference between the second signal and the master signal is repeatedly derived, and, upon said second parameter traversing a predefined divergence value, said steps (i) to (iv) are repeated.

6. A method according to claim 1 in which the relay station modifies the first signal by passing it through a coupling cancellation unit having an input receiving the first signal and an output outputting said second signal, and including said digital filter and a subtracter, the input of the coupling cancellation unit being an input to the subtracter and an output of the subtracter being passed to the output of the cancellation unit and to an input of the digital filter, the subtracter subtracting the output of the digital filter from the received signal.

7. A method according to claim 6 in which the output of the coupling cancellation unit includes a switch, the second signal being selectively transmitted via the switch to an amplifier which amplifies the second signal prior to transmission, said interruption of the transmission being performed by opening the switch.

8. A method according to claim 1 in which said step of modifying said digital filter coefficients includes: deriving a discrete Fourier transform of the second signal; employing said discrete Fourier transform of the second signal and a discrete Fourier transform of said estimated interference to derive correction values for said digital filter coefficients expressed in the frequency domain; and transforming said correction values into the time domain by an inverse Fourier transform operation, the digital filter coefficients being modified based on the time domain correction values.

9. A method according to claim 8 in which each of the digital coefficients of the digital filter modifies the first signal at pairwise time delay intervals T_p, the product of T_p and the number of digital coefficients being substantially equal to a maximum delay time of a mulitpath interference component of the first signal.

10. A method according claim 9 in which the inverse Fourier transform generates an number of output time domain values equal to or slightly larger than the number of digital coefficients.

11. A method according to claim 9 in which the inverse Fourier transform operates on a number of frequency domain values lower than the number of subcarriers used in practice.

12. A method according to claim 1 in which said master signal is in a format in which symbols are coded by differences between consecutive segments of the master signal, and said adjustment of the digital filter

coefficients minimizes an estimated error in the estimation of differences between consecutive segments of the master signal.

13. A method according to claim 12 in which the format of the master signal encodes symbols by phase differences between consecutive segments.

14. A method of modifying the values of a plurality of digital filter coefficients for use by a digital filter which is a component of a relay station, the relay station successively receiving a first signal, modifying the first signal using the digital filter to form a second signal, and transmitting the second signal with amplification, said first signal including a master signal subject to an interference having a maximum delay time, each of the digital coefficients of the digital filter modifying the first signal at pairwise time delay intervals T_p, the method including:

deriving a discrete Fourier transform of the second signal;

employing said discrete Fourier transform of the second signal to derive correction values for said digital filter coefficients expressed in the frequency domain; and

transforming said correction values into the time domain by an inverse Fourier transform operation, the digital filter coefficients being modified based on the time domain correction values,

wherein:

the product of T_p and the number of digital coefficients is substantially equal to the maximum delay time of the interference component of the first signal, and

the inverse Fourier transform generates an number of output time domain values equal to or slightly larger than the number of digital coefficients.

15. A method of modifying the values of a plurality of digital filter coefficients for use by a digital filter which is a component of a relay station, the relay station successively receiving a first signal, modifying the first signal using the digital filter to form a second signal, and transmitting the second signal with amplification, said first signal including a master signal and a coupling component, the master signal being in a format in which symbols are coded by differences between consecutive segments of the master signal, and the coupling component being derived from the second signal, the method comprising:

(i) deriving an estimate of differences between consecutive segments of the master signal;

(ii) estimating an error in said estimation of differences between consecutive segments of the master signal; and

(iii) modifying said digital filter coefficients to reduce said estimated error.

16. A coupling cancellation device for a relay station, the relay station receiving a first signal and transmitting it to a coupling cancellation device, receiving a second signal from the coupling cancellation device, transmitting the second signal to an amplifier and transmitting the amplified second signal,

the coupling cancellation device including a digital filter based on a plurality of filter coefficients and arranged to generate a correction signal for combination with the first signal for reducing interference in the second signal, a digital signal processing unit which determines the filter coefficients, and a switch which selectively transmits the second signal to the amplifier of the relay station;

whereby the switch can be controlled not to transmit the second signal when it is desired to estimate multipath interference in the first signal.

17. A coupling cancellation device according to claim 16 in which the digital filter receives and the digital signal processing unit each receive said second signal, the coupling cancellation device further including a subtraction circuit receiving the correction signal from the digital filter and subtracting the correction signal from the first signal to generate the second signal.

18. A coupling cancellation device according to claim 17 in which the digital signal processing unit transforms the second signal into the frequency domain using a FFT to extract signals over pilot carriers for estimation of the channel transfer function, the digital signal processing unit including a switch

for selectively transmitting the channel transfer function to a multipath interference estimation unit or to a digital filter coefficient determination unit.

19. A coupling cancellation device for a relay station, the relay station receiving a first signal and transmitting it to a coupling cancellation device, receiving a second signal from the coupling cancellation device, transmitting the second signal to an amplifier and transmitting the amplified second signal, the first signal being subject to an interference having a maximum delay time,

the coupling cancellation device including:

a digital filter based on a plurality of filter coefficients and arranged to generate a correction signal for combination with the first signal for reducing interference in the second signal, each of the digital coefficients of the digital filter modifying the first signal at pairwise time delay intervals T_p, and

a digital signal processing unit which determines the filter coefficients by:

deriving a discrete Fourier transform of the second signal;

employing said discrete Fourier transform of the second signal to derive correction values for said digital filter coefficients expressed in the frequency domain; and

transforming said correction values into the time domain by an inverse Fourier transform operation, the digital filter coefficients being modified based on the time domain correction values,

wherein:

the product of T_p and the number of digital coefficients is substantially equal to the maximum delay time of the interference component of the first signal, and

the inverse Fourier transform generates an number of output time domain values equal to or slightly larger than the number of digital coefficients.

20. A coupling cancellation device for a relay station, the relay station receiving a first signal and transmitting it to a coupling cancellation device, receiving a second signal from the coupling cancellation device, transmitting the second signal to an amplifier and transmitting the amplified second signal, the master signal being in a format in which symbols are coded by differences between consecutive segments of the master signal,

the coupling cancellation device including a digital filter based on a plurality of filter coefficients and arranged to generate a correction signal for combination with the first signal for reducing interference in the second signal, and a digital signal processing unit which determines the filter coefficients,

the digital signal processing unit being arranged to derive an estimate of differences between consecutive segments of the master signal, estimate an error in said estimation of differences between consecutive segments of the master signal, and modify said digital filter coefficients to reduce said estimated error.

21. A relay station incorporating a coupling cancellation unit according to claim 16.

22. A relay station incorporating a coupling cancellation unit according to claim 19.

23. A relay station incorporating a coupling cancellation unit according to claim 20.